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TAXONOMY OF *POLYTAENIA* (APIACEAE): P. NUTTALLII AND P. TEXANA

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ABSTRACT

The two species of *Polytaenia* appear to be nearly identical in vegetative and floral features, but fruit morphology shows a distinct and unequivocal difference. *Polytaenia texana* is the species in most of Texas and in southern Oklahoma. *Polytaenia nuttallii* is widespread, from Oklahoma, a few counties in northeastern Texas, and Louisiana, north to Minnesota and Michigan (historically), and east to Kentucky, Tennessee, and Alabama. The two species are mapped by county and distinguished by a key, descriptions, and illustrations.

KEY WORDS: *Polytaenia nuttallii*, *Polytaenia texana*, Apiaceae

Polytaenia texana has been a generally accepted member of the Texas flora since Mathias and Constance treated it at specific rank (first in 1941, then 1945, 1961) and later contributed the treatment of Umbelliferae to the Texas Manual (Mathias & Constance 1970). Coulter and Rose (1900, 1909) had treated it as a variety of *P. nuttallii*. Diggs et al. (1999) included *P. texana* using the species key by Mathias and Constance, and it has been listed in recent Texas floristic summaries (Hatch et al. 1990; Johnston 1990; Jones et al 1997). Thus the genus *Polytaenia* has comprised the supposedly Texas near-endemic as well as the *P. nuttallii*, which ranges more broadly.

Coulter and Rose and Mathias and Constance also saw the distinction of *Polytaenia texana* mostly in the fruit morphology (Figure 1 shows the distinction as observed by Mathias and Constance). The couplet first provided by Mathias and Constance (and repeated in subsequent publications) is below; geography is from the Texas Manual treatment.

1. Fruit 5–11 mm x 4–7 mm, lateral wings narrower and thicker than the body, oil ducts indistinct, several in the intervals; in sandy soil in the Timber Belt and the Blackland Prairies; from Texas and Louisiana, north to Kentucky, Michigan, and Iowa ..... **Polytaenia nuttallii**
1. Fruit 9–11 x 6–7 mm, lateral wings broader and thinner than the body, oil ducts distinct, solitary in the intervals; abundant on the Blackland and Coastal prairies and the Edwards Plateau; endemic to Texas .... **Polytaenia texana**

In the most extreme affirmation of the distinctiveness of *Polytaenia nuttallii* var. *texana* from typical *P. nuttallii*, St. John (1919) was so impressed by the fruit differences that he raised var. *texana* to specific rank and placed it in the new genus *Phanerotaenia*, (Greek, *phaneros*, visible, evident, *tainia*, ribbon, alluding to the oil ducts), distinct from *Polytaenia* (many oil ducts, as evident in *P. nuttallii*).

On the other hand, ambiguity in the identification of *Polytaenia texana* surely has been underlain by lack of specificity regarding its geographic distribution. The most explicit description of its geography has been by BONAP (2012), which maps *P. texana* mostly in central Texas counties, sympatric with the broadly distributed *P. nuttallii*. Inclusion of *P. texana* by Diggs et al. places it in the region of north-central Texas (including a few counties of the Edwards Plateau). The description in the 1970 Manual (as in the couplet above) positions *P. texana* as widely distributed in Texas and sympatric with *P. nuttallii*.

Figure 1. *Polytaenia nuttallii* (1) and representative mericarps: *P. texana* (2, 3) and *P. nuttallii* (4, 5). From Mathias and Constance 1961.

Outside of Texas, *Polytaenia texana* has been included in the Oklahoma flora on the basis of a collection from Oklahoma Co. (OVPD 2012), in the central part of the state.

The recent Texas Atlas (Turner et al. 2003) mapped only *Polytaenia nuttallii* in Texas, tacitly acknowledging the apparent difficulty of distinguishing the two species there. Turner (pers. comm. 2012) considered *P. texana* to be a synonym of *P. nuttallii*, though it was not listed as such.

The present study confirms the existence of two species of *Polytaenia* and their distinction based on fruit morphology (Figs. 2, 3,4; key couplet below). Differences between the two species are seen most clearly in fully mature fruits, but the distinctions begin to be evident earlier in maturation. A unequivocal means of distinguishing plants in early flower is not evident, but with the map provided here (Fig. 5), this now will be critical only along the zone where the two are contiguous in range or nearly so. Within the range of *P. texana* in extreme northeastern Texas, fruits of some populations have relatively thickened lateral wings, seemingly approaching the morphology of *P. nuttallii*, but the commissural faces are those of *P. texana* (e.g., Henderson Co., *Correll 38924*, LL; Smith Co., *Cory 56364*, SMU).

Molecular studies (Downie et al. 2002; Sun et al. 2004; Sun & Downie 2010a; Sun & Downie 2010b) indicate that the two species of *Polytaenia* ally as a strongly supported monophyletic group with molecular (nucleotide substitution) differences between them. In Downie et al. (2002) the voucher for *P. nutallii* is from Illinois, but in Sun and Downie (2010a) the voucher for *P. nuttallii* is from Grayson Co., Texas (along the Oklahoma border), and probably represents a population of *P. texana* (see distribution map, Fig. 5). The only voucher for *P. texana* has been from Burnet Co. (in the central part of the state). Thus, in the later study (Sun & Downie 2010a) both samples are almost certainly of the same species.

The difficulty in distinguishing the two taxa in Texas probably has been because two species have been sought where essentially only a single species occurs. The widespread species in Texas and the one most Texas botanists are familiar with is *P. texana*, but it has usually been identified as *P. nuttallii*. True *Polytaenia nuttallii* occurs only in a few northeastern counties and the geographic relationship between the two species (Fig. 5) has previously been undetermined. *Polytaenia texana* also occurs across the southern third of Oklahoma. The distribution of the two species apparently is essentially parapatric.

The Texas and Oklahoma plants, as well as some from Oklahoma, Kansas, and Arkansas (including Nuttall's type, Fig. 6), tend to have wider leaf segments than elsewhere in the range (Fig. 8). Eastern outlyers in Alabama often have very narrow segments. There does not appear to be a clear break in the pattern of leaf variation nor is it correlated with the distinction in fruit morphology.

Figure 2. Representative variation in mericarps of *Polytaenia texana*. Dorsal faces. The large fruit at upper left is from a collection from Kaufman Co., Texas (*Cory 53280*, SMU); the longest fruits on this plant are 15 mm.

Figure 3. Representative variation in mericarps of *Polytaenia nuttallii*. Dorsal faces.

Figure 4. Commissural faces of mericarps. A. *Polytaenia texana*. B. *Polytaenia nuttallii*.

POLYTAENIA DC., Coll. Mém. Ombellif. 5: 53, plate 13. 1829. **TYPE**: *Polytaenia nuttallii* DC.

Pleiotaenia Coulter & Rose, Contr. U.S. Natl. Herb. 12: 448. 1909. **TYPE**: *Pleiotaenia nuttallii* (DC.) Coulter & Rose Coulter and Rose proposed the substitute name for *Polytaenia* because of the slightly earlier *Polytaenium* Desv. (Mem. Soc. Linn. Paris 6: 218. 1827). The current Code, however (ICBN 2006, Article 53.3, Ex. 10) would regard these as " Names not likely to be confused," as did even the 1906 Rules, albeit on a more mechanical basis, as pointed out by St. John (1919).

Phanerotaenia H. St. John, Rhodora 21: 182. 1919. **TYPE**: *Phanerotaenia texana* (Coulter & Rose) H. St. John

Perennial herbs, without odor, moderately to densely scabrous in the inflorescence with minute, conic, papillate hairs, otherwise glabrous; taproot thickened. **Stems** 5–15 dm. **Leaves**: basal 1–2-pinnately compound, cauline 1-pinnately compound, blades oblong to ovate in outline, 8–18 cm x 8–15 cm, herbaceous and slightly thickened; leaflets 3–5, pinnately to subpinnately divided, lobes ovate or oblanceolate to narrowly oblong, 2–4 cm x 1–2.5 cm, bases rounded to cuneate, sessile to petiolulate, margins coarsely serrate; petioles with dilated sheaths. **Inflorescence**: peduncles terminal and axillary, 1–10 cm; rays 1–2.5(–4) cm, subequal to unequal. **Umbels** compound; umbellets 6–25; involucral bracts absent or 1 and ca. 1 mm, involucel bracts linear. **Pedicels** 2–6 mm. **Flowers** protogynous; sepals lanceolate-subulate, persistent; petals yellow to yellow-green or greenish yellow, rarely yellow-orange, apices extended into an appendage half as long as the petal and folded under and adnate to the abaxial surface; stylopodium absent. **Schizocarps** broadly oval to orbicular or obovate, strongly flattened dorsally, 5–11(–15) mm x 4–7 mm, splitting into 2 mericarps, narrowly to broadly corky-winged, wings variable in width and thickness, dorsal ribs 3, oil ducts 3 dorsally, 1 in the intervals, usually 2 or 4 on the commissural face, surface smooth, glabrous; carpophore completely divided the whole length. Base chromosome number, **x** = 11.

The closest relatives of *Polytaenia* according to molecular analyses apparently are *Thaspium* and *Zizia* (Sun & Downie 2010a), all of subfamily Apioideae.

1. Mature mericarps with lateral wings distinctly thickened, thicker than the face; oil tubes of dorsal face (6–)8–10, laterally contiguous, covered by epidermis and pericarp and indistinct; oil tubes of commissural face 4, raised and distinct, a contiguous pair on each side of the midrib ..... **Polytaenia nuttallii**
1. Mature mericarps with lateral wings relatively thin, same thickness as the face; oil tubes of dorsal face usually 4, raised and distinct; oil tubes of commissural face 2, raised and distinct, one on each side of the midrib ..... **Polytaenia texana**

1. Polytaenia nuttallii DC., Coll. Mém. Ombellif. 5: 54, plate 13. 1829. *Pleiotaenia nuttallii* (DC.) Coulter & Rose, Contr. U.S. Natl. Herb. 12: 448. 1909. **TYPE: USA. Arkansas.** "Arkansa," 1825, *T. Nuttall s.n.* (holotype: G-DC; isotype: PH digital image!). Illustration from de Candolle's protologue, Fig. 7.

Stems 5–10 dm. **Leaves**: 8–18 cm x 8–15 cm in outline; leaflets 2–4 cm x 1–2.5 cm; petioles 4–16 cm. **Inflorescence**: rays (10–)20–40 mm. **Umbellets** (6–)10–25, (6–)12–22(–42)-flowered. **Pedicels** 2–6 mm. **Mature mericarps** 6–9 mm x 4–6 mm, dorsal ribs not evident; lateral wings distinctly thickened, thicker than the face; oil tubes of dorsal face (6–)8–10, laterally contiguous (apparently connate at the edges), covered by epidermis and pericarp and indistinct, oil tubes of commissural face 4, raised and distinct, a contiguous pair on each side of the midrib. $2n = 22$ (*Ahles 7974*, VDB!, Jefferson Co., Missouri; Bell & Constance 1957).

Flowering Apr–Jun. Blackland prairies, chalk prairies and outcrops, limestone glades, barrens, open rocky woods, rocky hillsides and barrens, rock crevices, sandy pine and pine-oak woodland, roadsides, old fields; 100–300(–900) m; Ala., Ark., Iowa, Ill., Ind., Kan., Ky., La., Mich., Minn., Miss., Mo., Neb., N.Dak., N.Mex., Okla., Tenn., Tex., Wis. *Polytaenia nuttallii* is presumed extirpated in Kentucky (Chester & Wofford 1992), Michigan (Voss 1985), and Minnesota (MDNR 2012). Ecological summaries by states are given by Heikens (2002).

Polytaenia nuttallii in **Texas**. Bowie Co.: just W of New Boston, along pond off Hwy 82, 6 Jun 1965, *Correll & Correll 31169* (BRIT); 6 mi W of Hooks, 1.4 mi W of exit Red River Army Depot, sandy clay of clearcut in oak-pine flats by I-30, 4 May 1998, Kral 87550 (VDB); 4.4 mi W of Hooks, open pine-oak woodland, sandy soil, 1 Apr 1949, *Whitehouse 21090* (SMU). Harrison Co.: along Hatley Creek, between Red Oak Rd and Shreveport-Camden Rd, ca. 5 mi SE of Hallsville, 14 May 1977, *Ajilvsgi 4031* (BRIT); beside I-20, 2 mi E of Farm Rd 2015, 6 May 1967, *Weston 66* (VDB).

Both species occur primarily in blackland soil and over limestone substrate but both also grow abundantly in sandy habitats. The sandy habitats of *Polytaenia nuttallii* apparently are mostly in the Texas counties at the southwestern corner of its range.

2. Polytaenia texana (Coulter & Rose) Mathias & Constance, Bull. Torrey Bot. Club 68: 123. 1941. *Polytaenia nuttallii* DC. var. *texana* Coulter & Rose, Contr. U.S. Natl. Herb. 7: 192. 1900. *Pleiotaenia nuttallii* var. *texana* (Coulter & Rose) Coulter & Rose, Contr. U.S. Natl. Herb. 12: 448. 1909. *Phanerotaenia texana* (Coulter & Rose) H. St. John, Rhodora 21: 182. 1919 (by type but not by description). **TYPE: USA. Texas.** [Austin Co.:] Near Industry, 1895, *H. Wurzlow s.n.* (holotype: US digital image!).

Stems 5–15 dm. **Leaves**: 8–18 cm x 8–15 cm in outline; leaflets 2–4 cm x 1–2.5 cm; petioles 4–13 cm. **Inflorescence**: rays (10–)15–35 mm. **Umbellets** 8–17, (7–)12–20-flowered. **Pedicels** 2–6 mm. **Mature mericarps** 5–11(–15) mm x 4–7 mm, dorsal ribs distinct, 3, thin, orange; lateral wings relatively thin, same thickness as the face; oil tubes of dorsal face usually 4, sometimes 6 (the outer 2 doubled), raised and distinct; oil tubes of commissural face 2, raised and distinct, one on each side of the midrib. Chromosome number not reported.

Flowering Apr–Jun. Blackland prairies, coastal prairies, mesquite prairies, oak-pine woods, sandy oak woods, sandy alluvium along rivers, ditches, rocky hillsides, oak-juniper slopes, roadsides, fencerows, old fields; 10–350 m; Okla., Tex.

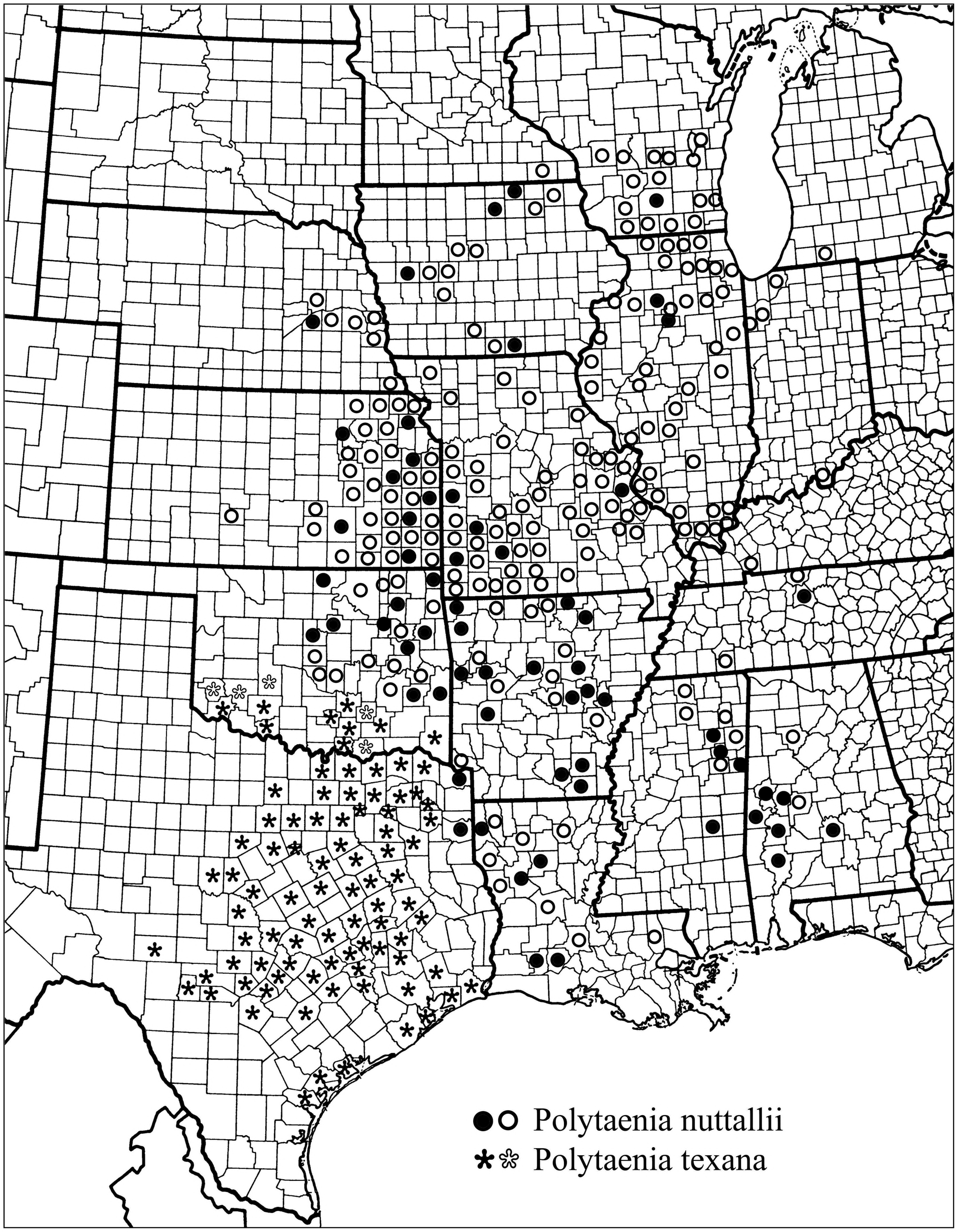
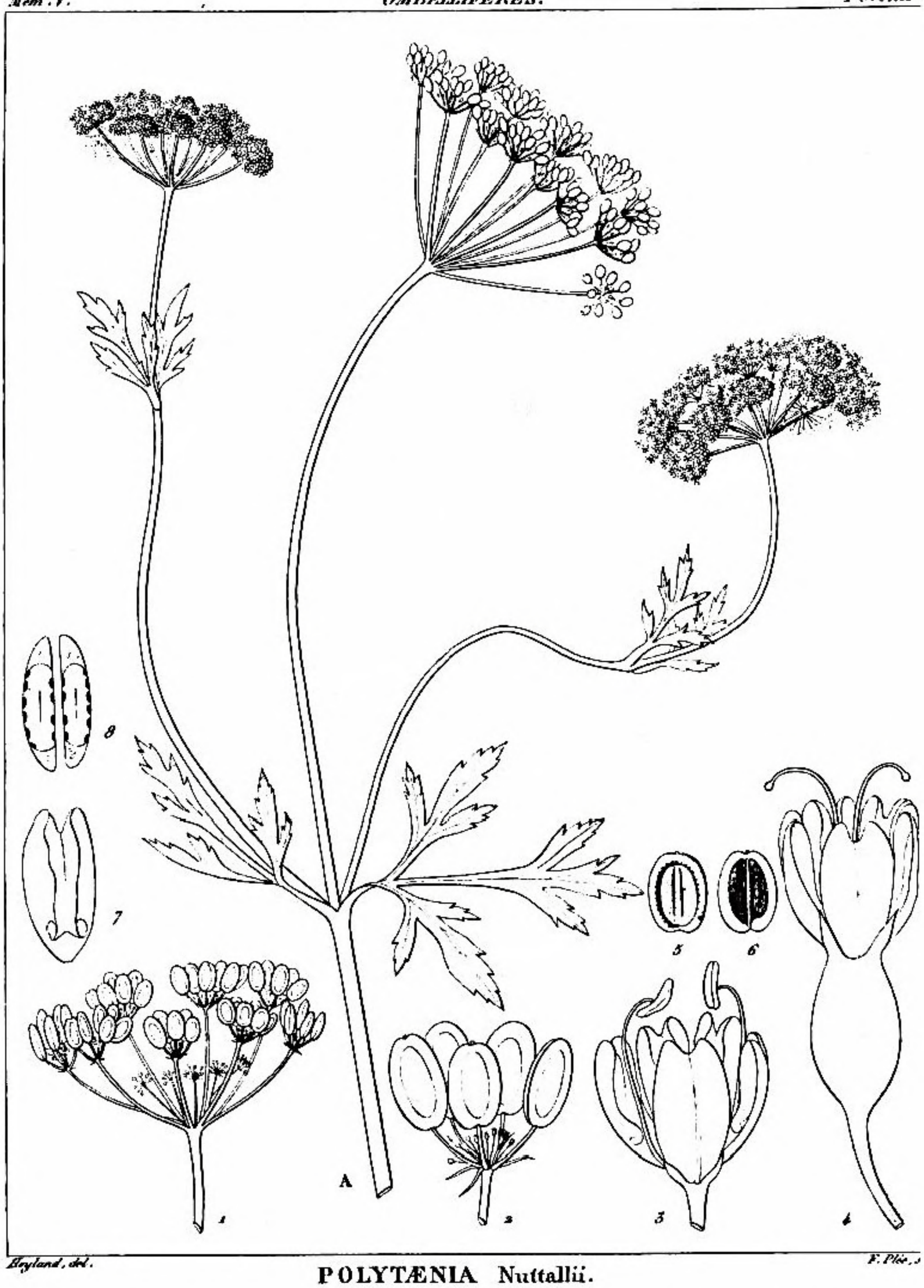


Figure 5. County distribution of *Polytaenia nuttallii* and *P. texana.* Based on records from SMU-BRIT-VDB and TEX-LL. Hollow symbols are from literature, vouchers not seen. Identifications of collections not seen from the Oklahoma zone of parapatry are speculative.

Figure 6 *Polytaenia nuttallii* – isotype collection (PH) by Thomas Nuttall from Arkansas.



POLYTÆNIA Nuttallii.

Figure 7. *Polytaenia nuttallii*. Plate 13 from DC., Coll. Mém. Ombellif. 5. 1829. Detail 7 shows the abaxial view of a petal, with the apex extended into an appendage and sharply folded under. The appendages on a pair of petals clasp an anther and hold it to the outside.

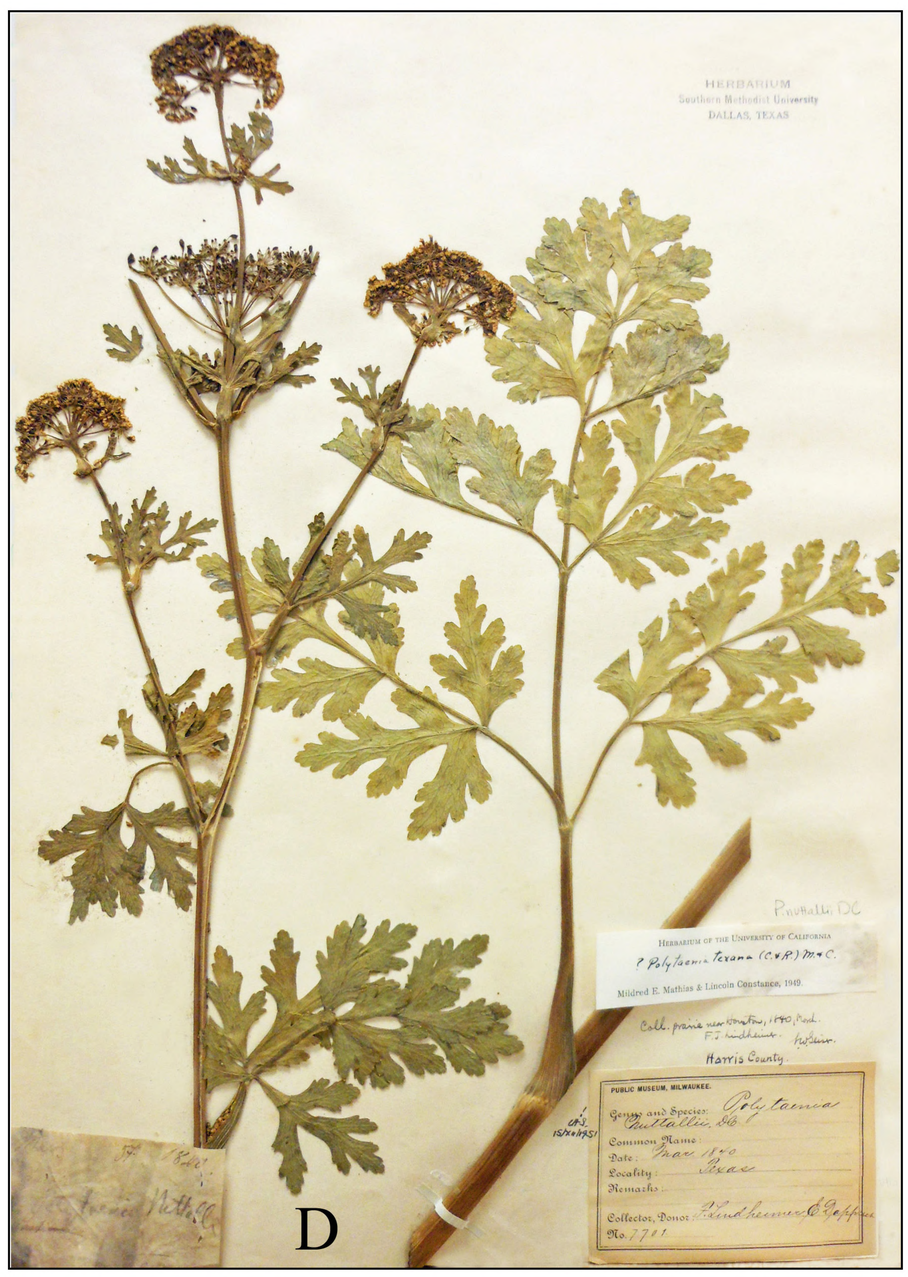


Figure 8. Representative variation in leaf morphology. *Polytaenia nuttallii* (A, B) and *P. texana* (C, D).

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